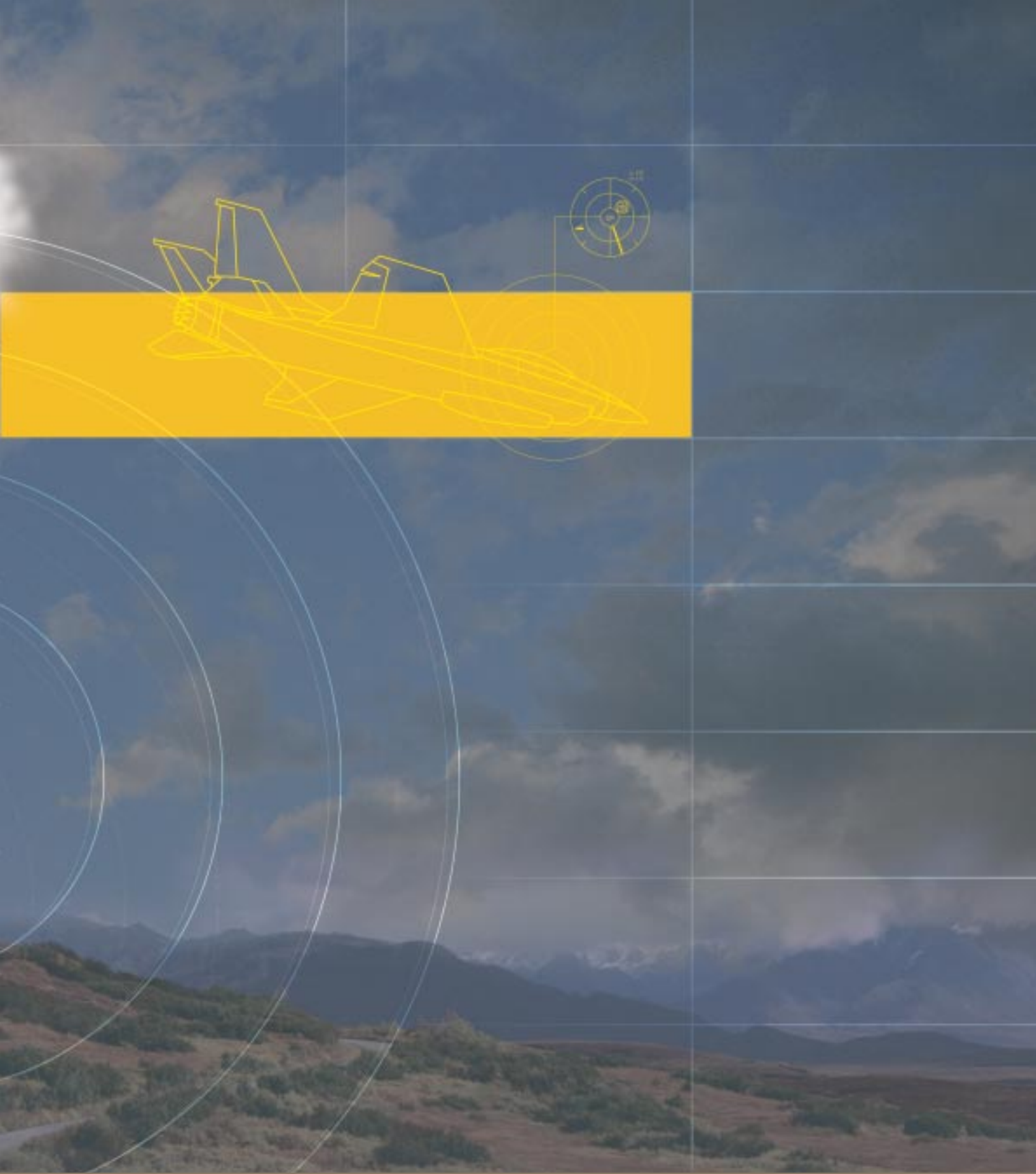


AN/ALQ-213(V)
Electronic Warfare Management System

Integrates and Controls Electronic Warfare Self Protection Systems

Pilot Workload

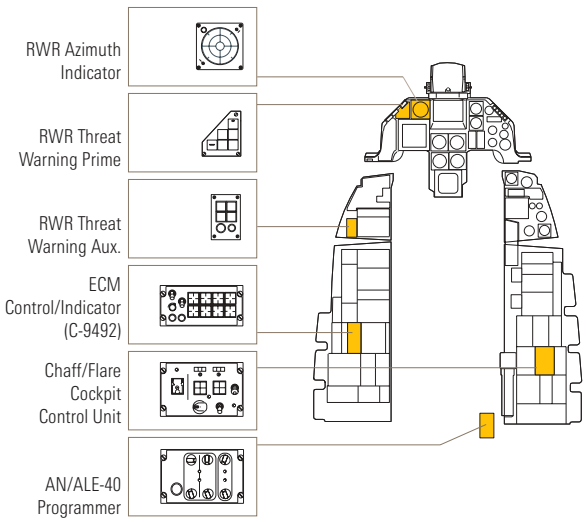
EWMS reduces the pilot's workload and ensures correct response to threats.

Terma's AN/ALQ-213(V) Electronic Warfare Management System (EWMS) was originally developed for the F-16 in close cooperation with the Danish Air Force. The objectives were to reduce the pilot's workload and to ensure prompt, coordinated and effective use of all the on-board EW subsystems.
However, it soon became clear that other military aircraft had similar requirements. Consequently, the EWMS was developed into a generic system, which fulfills the requirements of a large number of aircraft types including fighters, helicopters and transport aircraft. The EWMS integrates, manages, and controls a variety of EW subsystems.

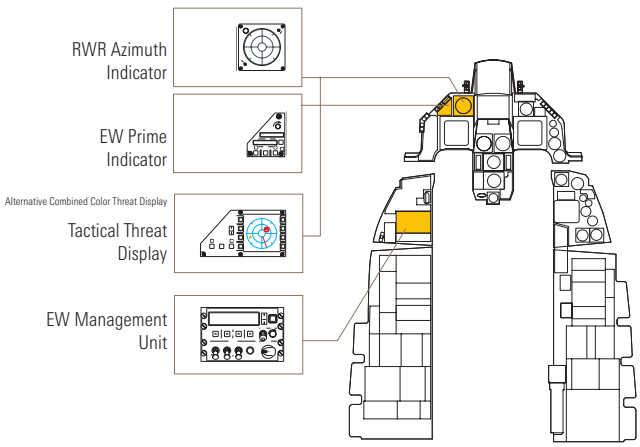
Cockpit View of an EWMS modified F-16

The EW Management Unit (EWMU) is located on the left-hand console close to the throttle quadrant.
The EW Prime Indicator (EWPI) is placed up front on the instrument panel inside the pilot's view cone. A new multi-function Tactical Threat Display (TTD) has been developed to replace the alphanumerical EWPI and the dedicated Radar Warning Receiver (RWR) Azimuth Indicator.
Not seen on the illustration are the control stick and elbow countermeasures management switches, which allow the pilot to operate the system without moving his hands away from the throttle and control stick during flight.
Threat display indications are accompanied by audio/voice cues.

F-16 Cockpit before EWMS



F-16 Cockpit with EWMS



EW Control Panels, previously dispersed virtually all over the cockpit have been replaced by the EW Management System.

Pilot Vehicle Interface

User Requirements determine cockpit layout

The size of the EWMS components and the flexibility of the system allow it to be built into any type of aircraft, be it a fighter, helicopter or a transport aircraft.

Examples are the F-16 in the Mid-Life Update configuration, the C-130 Hercules and the AS-532 Cougar as illustrated.

In each case the exact configuration is determined in close cooperation with the operational users.

C-130H

In the C-130H illustrated, the EWMS installation is tailor-made for a three crew cockpit. The EWMU is placed on the navigator's console.
In order to achieve the best possible situational awareness, pilot, co-pilot and navigator all have EWPIs. Additional remote EW activation switches are available for other crew members.

C-130J

In the C-130J, the EWMS is fully integrated with the core avionics and the C-130J glass cockpit. The EWMU is placed in the center console.

AS-532 Cougar cockpit with EWMS

Two Tactical Threat Displays (TTDs) on the far left- and right-hand sides of the instrument panel give the captain and co-pilot the best possible view of RF and IR threat indications, jam assignment, EOB information and menus to operate the entire EW suite. The EWMU is located in the center console for both pilots to reach.

The Tactical Data Unit (TDU) is situated in the cabin behind the cockpit. A data transfer cartridge is inserted prior to flight to upload all EW mission data into the system and to record threat parameters, geographical position, aircraft attitude and other valuable operational data real-time during flight. After flight the cartridge can be removed for post-flight mission analysis. The TDU also provides for synthetic voice cueing and embedded training modes during flight.

EWMS Functions

The EWMS replaces all existing discrete EW control panels and indicators.

Single Point Control

All subsystems are controlled from the EWMS, either by operating the software driven menus or through dynamic processing and automatic activation by the Electronic Combat Adaptive Processor (ECAP).

Electronic Warfare Management Unit
- EWMU - for all types of aircraft

Modes of Operation

Manual The pilot/operator selects and activates the countermeasure program for the threat.

Semiautomatic The ECAP processor analyses the threat signals, computes the most effective combination of countermeasures and cues the pilot. He then initiates the computerized script program by activating a consent switch located on the control stick. The pilot keeps his hands on throttle and control stick.

Automatic Analysis and selection of the threat adapted countermeasure responses take place as in semiautomatic. The system will automatically initiate the response without pilot intervention. The pilot will be notified via synthetic voice message, display message/graphical symbols or multi-dimensional audio.

Up Front Control and Display

The EWPI presents the pilot with prioritized information about the status of the EW subsystems:

Dispenser Indication of usable decoy payloads remaining, including low level cues and indication of dispense system activity.

Jammer Operating mode/technique selection and jammer status.

Radar Warning Dedicated function buttons and status lights.

Missile Warning Subsystem activation and indication of declared missile threat approach angle and time to impact (depends on type of Missile Warning System).

Electronic Warfare Prime Indicators - EWPI - two versions

F-16

Other aircraft

System software and mission data can be loaded through the EWAP or via the Mil-Std-1553B Mux Bus. The EWMS provides for multiple in-flight selections of pre-flight loaded jamming and dispensing programs via menus.

Electronic Warfare Aircraft Ground Equipment Panel – EWAP

EWMS Interfaces

Not only does the EWMS integrate all EW subsystems into one coordinated EW suite, it also interfaces to the aircraft core avionics system

The EWMS provides multiple electrical interface signals, such as Mil-Std-1553B avionics and EW buses, RS-232, RS-422, RS-485, and PPD serial digital buses, and an assorted number of software programmable discrete I/O-lines. The interfaces include integration with core avionics, stores management system and other aircraft systems.

The electrical interface makes the EWMS adaptable for installation in a number of military aircraft. The EWMS is designed with a flexible systems architecture, which enables it to integrate and control a variety of EW subsystems. The EWMS controls are not limited to EW systems. The EWMS has been chosen by the Danish, Belgian and US Air Forces to operate their F-16 Tactical Reconnaissance Systems.

The EWMU represents a multi-processor systems architecture suited to meet the objectives of the EWMS, to integrate systems, reduce pilot workload, and make the most effective use of the capabilities of the EW subsystems. This architecture facilitates enhancements and updates via software controlled functionality. The processing capacity of the EWMS allows for software reprogramming and, thus, for an extensive growth potential for the existing EW subsystems and the EWMS itself.

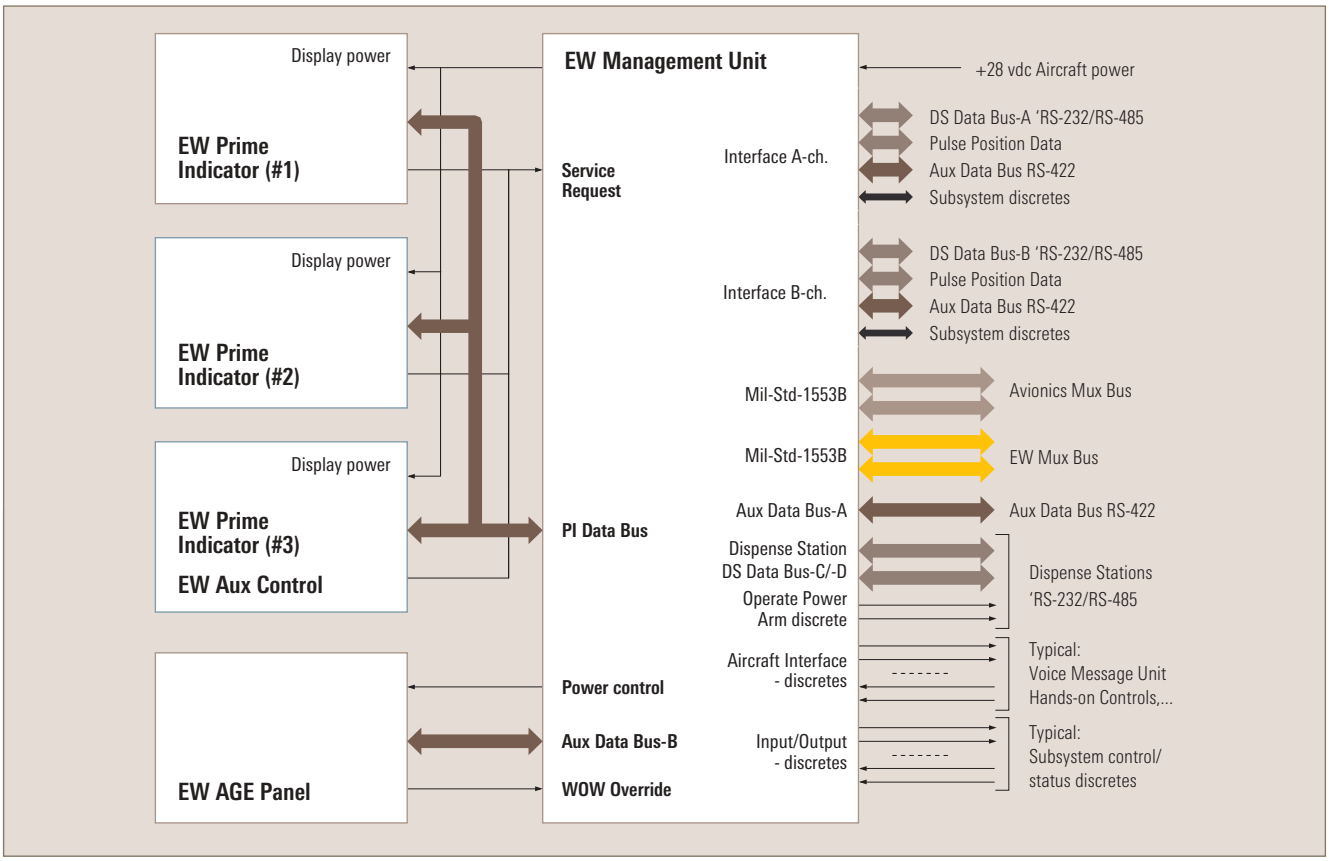
The processing capacity and flexible architecture of the EWMS permits an uncomplicated addition of new systems such as:

- Laser Warning
- Towed Decoy
- Directed IR Countermeasure Systems,

and it ensures systems integrity during updates.

Examples of EW subsystems controlled by the EWMS

Dispenser:	RWR:	Jammer:	MWS:
ACMDS	ALR-68	ALQ-131	AAR-47
PIDS-3	ALR-69	ALQ-162	AAR-54
PIDS+	ALR-69IV	ALQ-165	AAR-57
ALE-47	ALR-56M	ALQ-176	AAR-60
ALE-50	SPS-1000V5	ALQ-184	EL/M-2160
	APR-39B(V)2	EL/L-8222	



EWMS Upgrades

Missile Warning System integration

The threat from IR guided weapons gets special attention worldwide. UV/IR-based Missile Warning Systems (MWSs) are maturing and coming into service on many types of military aircraft. The required interface is already developed for Terma's EWMS to control and integrate these systems into the overall EW Self Protection Suite.

TTD for MWS Information

Many types of aircraft have no or limited provisions to display the threat information from missile warning systems to the pilot. The solution that Terma offers is a Tactical Threat Display (TTD), based on the latest multi-function display technology.

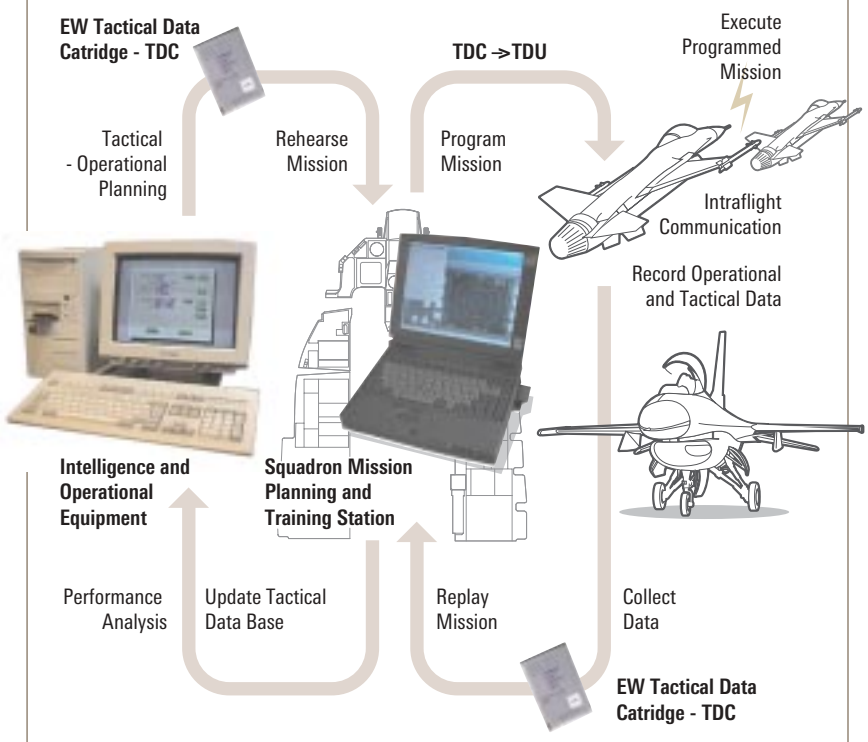
Three-dimensional Audio Warning

As part of the TTD, a three-dimensional audio warning will be given in the pilot's earphones. This will immediately alert the pilot to the direction of the threat and enable him to make evasive maneuvers.

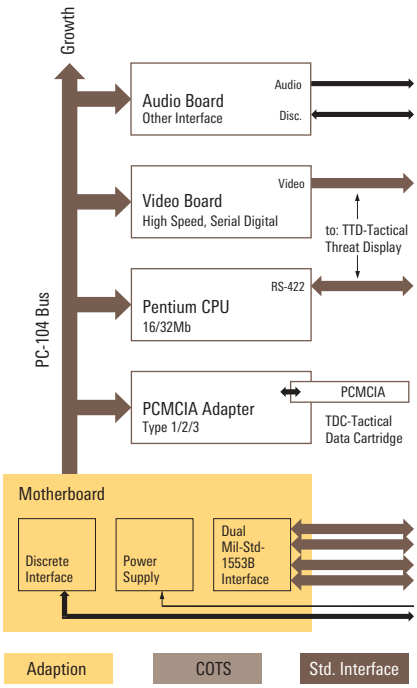
Tactical Threat Display - TTD

The Tactical Threat Display comes in two basic versions: a semi-triangular version to fit the F-16 instrument panel as replacement for the EWPI and RWR Azimuth Indicator; and a rectangular version for other aircraft.
The TTD is a graphic color display and it is arranged with a number of option select buttons (soft keys) to operate the EW subsystems.

Organic Recording



Tactical Data Unit – TDU



Tactical Data Unit - TDU

The Tactical Data Unit meets identified operational requirements for integrated EW system mission data load, organic threat parameter recording, geo-location, embedded training, post-mission data base reporting and effectiveness analysis by means of the detachable PC compatible PCMCIA Tactical Data Cartridge (TDC) plugged into the unit.

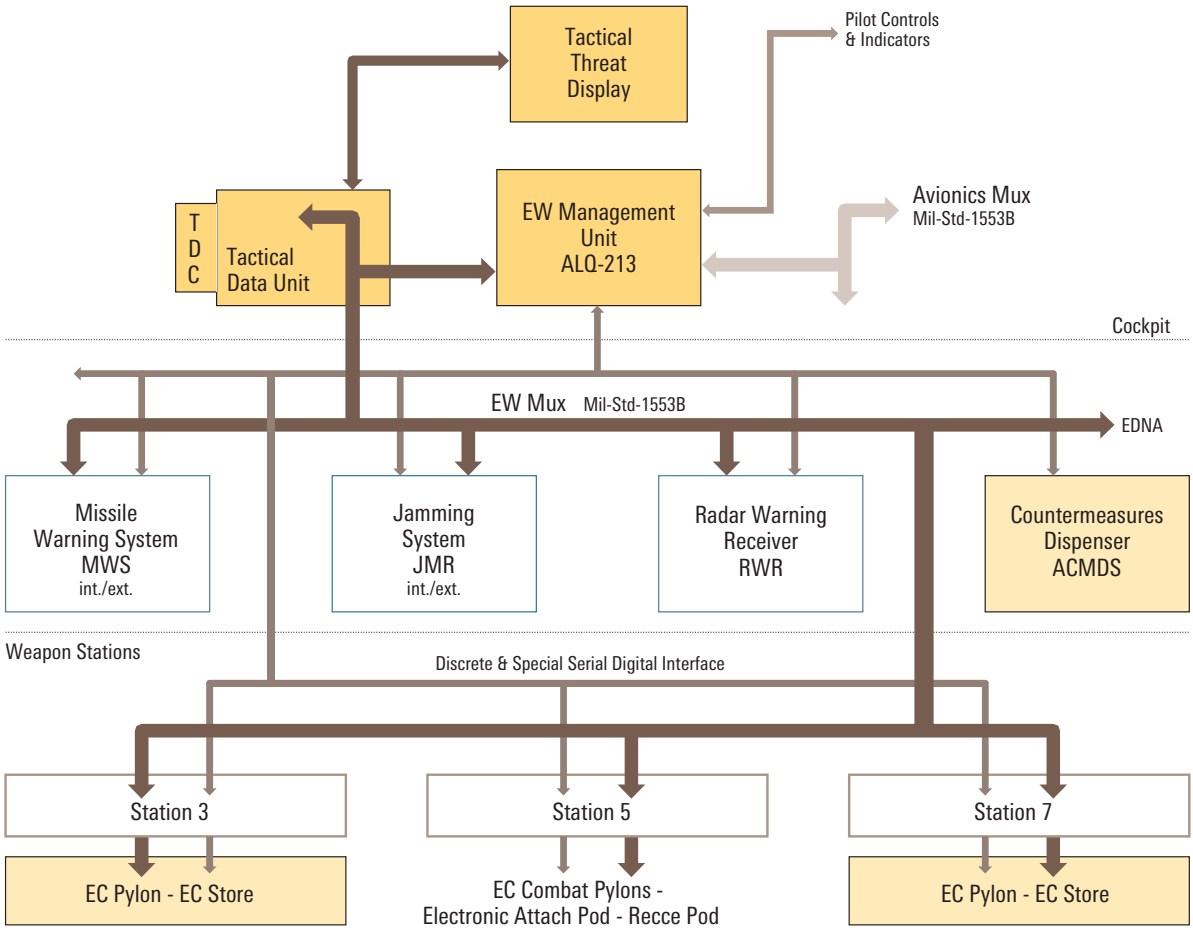
Total EW Integration

F-16 Integrated EW Suite

The block diagram below is a typical example of a fully integrated EW Self Protection Suite controlled by the EWMS and upgraded with TTD and TDU. The suite contains a RWR, an MWS, an Advanced Countermeasures Dispensing System (ACMDS), an active Jammer, and, in this example, also a Reconnaissance Pod.

The MWS in this example is a passive UV based system installed in the F-16 weapons pylon, a configuration that has been test flown in The Netherlands on behalf of the European F-16 nations. The test verified the feasibility of pylon mounted MWS sensors. It also verified that the EWMS is indeed able to control and integrate the MWS.

EWMS integrated Self Protection Suite



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TERMA

Survivability - Mission Effectiveness

Terma's AN/ALQ-213(V) Electronic Warfare Management System provides for effective integration of the electronic warfare suite onto fighters, transport aircraft and helicopters.

Selected by Australia, Belgium, Denmark, Germany, Norway, Portugal, the Netherlands and USA.

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